TEST REPORT

Applicant:	TFIVE PTY LTD
Address:	10/29 Lorne Ave Killara NSW 2071 Australia
Equipment Type:	Smart Door Lock D100 Zigbee Edition
Model Name:	ZNMS20LM
Brand Name:	Aqara
Test Standard:	Radiation Protection Series S-1 (refer section 3.1)
Test Date：	Jul. 13, 2022 - Jul. 18, 2022
Date of Issue:	Sep. 27, 2022

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Chen Huiming **Checked by:** Liyao Zong **Approved by:** Wei Yanquan (Chief Engineer)

Revision History

Version	Issue Date	Revisions Content
Rev. 01	Sep. 27, 2022	Initial Issue

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1. GENERAL INFORMATION

1.1 Test Laboratory

Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	☑ Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	☐ 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China

2. PRODUCT INFORMATION

2.1 Applicant Information

Applicant	TFIVE PTY LTD
Address	10/29 Lorne Ave Killara NSW 2071 Australia

2.2 Manufacturer Information

Manufacturer	Lumi United Technology Co., Ltd.
Address	Room 801-804, Building 1, Chongwen Park, Nanshan iPark, No. 3370, Liuxian Avenue, Fuguang Community, Taoyuan Residential District, Nanshan District, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	Smart Door Lock D100 Zigbee Edition
Model Name Under Test	ZNMS20LM
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	N/A
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	Bluetooth (BLE), Zigbee, NFC

The requirement for the following technical information of the EUT was tested in this report:

Operating Mode	Bluetooth (BLE), ZigBee	
Operating Frequency	Bluetooth (BLE)	2400 ~ 2483.5 MHz
	ZigBee	2400 ~ 2483.5 MHz
Antenna Type	Bluetooth (BLE)	PIFA Antenna
	ZigBee	PIFA Antenna
Exposure Category	General Population/Uncontrolled Exposure	
EUT Stage	Mobile Device	

3. STANDARD INFORMATION

3.1 Test Standard

No.	Identity	Document Title
1	Radiation Protection Series S-1	Standard for Limiting Exposure to Radiofrequency Fields - 100 kHz to 300 GHz
2	AS/NZS 2772.2:2016+AMD1:2018	Australian/New Zealand Standard Radiofrequency fields Part 2: Principles and methods of measurement and computation—3 kHz to 300 GHz

4. DEVICE CATEGORY AND LEVELS LIMITS

The field calculation does not take into account the antenna size, which is assumed to be a point source. An ideal isotropic antenna is used as a reference to compare the performance of practical antennas: ***P*** watts is radiated, from a point, uniformly over the surface of sphere of radius ***r***. The POINTING VECTOR gives the power density:
Assumed use distance from EUT to Human, **20 cm** separation distance warning is required. In this section, the power density at 20 cm location is calculated to examine if it is lower than the limit.

$$S = \frac{PG}{4\pi R^2}$$

Where:
S = power density
P = output power (W)
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Separation distance between radiator and human body (m)

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the following limits.

Compliance criteria
The worst case maximum exposure levels (Non Occupational) are given in Table 7 of the ARPANSA standard as shown belwo. The limits are given as Reference Levels which vary with the frequency. The General Public exposure category is applicable for this report.

ARPANSA Standard, Table 7: Reference Levels for the Time Averaged Exposure to RMS Electric and Magnetic Fields

Exposure Category	Frequency range	E-Field strength (V/m rms)	H-field strength (A/m rms)	Equivalent plane wave power flux density Seq (W/m^2)
Occupational	100 kHz – 1 MHz	614	1.63 / f	—
	1 MHz – 10 MHz	614 / f	1.63 / f	1000 / f (see note 5)
	10 MHz – 400 MHz	61.4	0.163	10 (see note 5)
	400 MHz – 2 GHz	$3.07 \times f^{0.5}$	$0.00814 \times f^{0.5}$	f / 40
	2 GHz – 300 GHz	137	0.364	50
General Public	100 kHz – 150 kHz	86.8	4.86	—
	150 kHz – 1 MHz	86.8	0.729 / f	—
	1 MHz – 10 MHz	$86.8 / f^{0.5}$	0.729 / f	—
	10 MHz – 400 MHz	27.4	0.0729	2 (see note 6)
	400 MHz – 2 GHz	$1.37 \times f^{0.5}$	$0.00364 \times f^{0.5}$	f / 200
	2 GHz – 300 GHz	61.4	0.163	10

Note:

1. f is the frequency in MHz.
2. For frequencies between 100 kHz and 10 GHz, Seq, E^2 and H^2 must be averaged over any 6 minute period.
3. For frequencies exceeding 10 GHz, S_{eq}, E^2 and H^2 must be averaged over any 9.6 × 104 / f 1.05 minute period (see note 1).
4. Spatial averaging of the time averaged reference levels of Table 7 should be performed according to the requirements of clause 2.7.
5. For occupational exposure, E and H reference levels of Table 7 are given in plane wave ratio at frequencies greater than or equal to 1 MHz. However, for many occupational exposure situations, equivalent plane wave power flux density is not an appropriate metric if 'far-field' exposure conditions do not apply. Survey meters may be calibrated in terms of W/m2, but both E and H will generally require independent measurement and evaluation if measured in the near-field.

For general public exposure E and H reference levels of Table 7 are given in plane wave ratio at frequencies greater than or equal to 10 MHz. However, equivalent plane wave power flux density is not an appropriate metric if 'far-field' exposure conditions do not apply. Survey meters may be calibrated in terms of W/m2, but both E and H will generally require independent measurement and evaluation if measured in the near-field.

5. MPE ASSESSMENT

5.1 Output Power

BLUETOOTH			
Mode	BLE		
	Low	Middle	High
EIRP (dBm)	**0.9**	0.8	0.3
Note: This report listed the worst case EIRP power value, please refer to BL-SZ2270425-601 report for more details.			

Zigbee			
Mode	O-QPSK		
	Low	Middle	High
EIRP (dBm)	**8.6**	8.3	8.0
Note: This report listed the worst case EIRP power value, please refer to BL-SZ2270425-602 report for more details.			

5.2 Assessment Result

Mode	Max. EIRP (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (W/m²)	Limit of Power Density (W/m²)	Verdict
Bluetooth	0.9	2.0	20	0.002	10	Pass
ZigBee	8.6	2.0	20	0.014	10	Pass

5.3 Conclusion

This EUT is deemed to comply with the reference level limits by Council Recommendation Radiation Protection Series No. 3: 2002 therefore the basic restrictions are compliant with human exposure limits.

Statement

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